Improving Energy Management at Water and Wastewater Utilities in Massachusetts

Indicators:

- Municipal energy cost savings achieved;
- Quantifiable reductions of greenhouse gases (CO_2) and other air pollutants (NOx, SO_2) from reduced energy use;
- Amount of on-site renewable power generation achieved at drinking water and wastewater treatment plants.

We are collecting the needed data on energy use through our collaborative work with energy utilities and the Department of Energy Resources to create these indicators for 2011, to allow an evaluation of improvements since 2007 when our efforts in this sector began. The current Energy Leaders project has set the following goals.

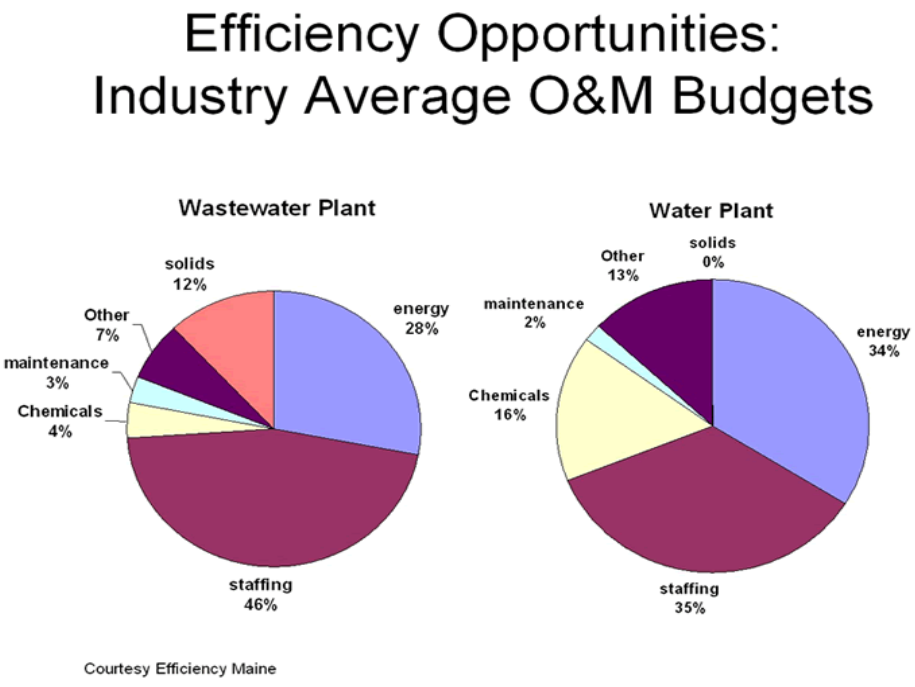
Goals (*):

1. Save facilities approximately $37 million per year in energy costs by 2015 through efficiencies and on-site renewable power generation;
2. Reduce wastewater utilities' energy use by 30% by 2015 ($27 million savings target);
3. Reduce drinking water utilities' energy use by 20% by 2015 ($10 million savings target);
4. Increase the sector's use of renewable energy by 50%; and
5. Double the number of "zero-net energy" Massachusetts water utilities

***** Using 2007 as the baseline year, when the Energy Management Pilot project began.

WHY IS THIS IMPORTANT?

Energy represents a substantial and rising cost to water and wastewater utilities – on average about 31 percent of a utility's operating budget. Energy costs are generally second only to labor costs for continuous facility operation. US EPA estimates that total electricity consumption at publicly-owned treatment works (POTWs) are approximately 75 billion kilowatt-hours (kWh), or about 3% of the total consumption of electricity in the United States. Additional energy is used at drinking water treatment facilities, making this sector a significant energy consumer with associated green house gas emissions.



Courtesy Efficiency Maine

It's currently estimated that cities and towns in Massachusetts spend more than $150 million per year in electrical costs and use about 1 billion kilowatt-hours (kWh) to treat 662 billion gallons of wastewater and drinking water.

HOW ARE WE DOING?

In 2007, the Executive Office of Energy and Environmental Affairs and MassDEP launched the first innovative phase of the Massachusetts Energy Management Pilot Project for Water & Wastewater Facilities - a project designed to reduce emissions of greenhouse gases and the amount of energy Massachusetts municipal facilities currently use to treat wastewater and drinking water by 20%.

Working in partnership with several other federal, state and private entities, 14 facilities had their energy use analyzed and their facilities audited to identify potential efficiencies as well as renewable generation feasibility.

List of Pilot Partners:

- Department of Energy Resources (MA DOER),
- EPA Region 1 (New England),
- University of Massachusetts - Amherst (UMass),
- Massachusetts Renewable Energy Trust (now the MA Clean Energy Center),
- Consortium for Energy Efficiency, and
- Major electric and gas utilities in the state.

Pilot Results: Over $3.7 million of potential annual energy savings were identified through efficiencies and renewable generation at the 14 pilot facilities, with an estimated average of 33% in potential annual energy savings. After project implementation, over 20 million kW hours will be saved and 17,000 tons of annual CO_2 reductions will be achieved. Renewable projects for these facilities are expected to generate over 7 megawatts of clean energy.

Pilot Financing: The Executive Office of Energy and Environmental Affairs, MassDEP and US EPA assisted in identifying funding sources to complete the identified recommendations for each of the facilities, including State Revolving Fund (SRF) and Federal Stimulus funding (ARRA) . In 2009, MassDEP reserved $56 million to fund 11 Clean Water SRF Green Infrastructure projects at pilot facilities and other locations, and another $12.6 million for 10 Drinking Water SRF Green Infrastructure projects. In total, $5 million in energy savings per year will result from this investment, and 22,000 tons of CO_2 emissions are anticipated to be removed each year.

WHAT'S BEHIND THE NUMBERS?

MassDEP estimates that if the energy reductions of the Pilot are achieved at the same levels throughout the entire water and wastewater sector, energy costs could be reduced by approximately $37 million, and annual emission reductions of approximately 200,000 tons of $C0_2$, 760,000 pounds of SO_2, and 250,000 pounds of NOx would be achieved.

MAINTAINING STRONG PERFORMANCE

The Bureau continues to search for and evaluate innovative ways to achieve environmental results and meet the challenges of reduced resources by increasing our own efficiency and prioritizing work on the most important environmental problems.

Reducing energy use, improving system efficiencies, and adding renewable energy generation at Massachusetts wastewater and drinking water utilities is a long-term commitment. Utilities are constantly challenged by rising operating costs, degrading infrastructure, public demands and regulatory requirements to provide high quality water treatment services at an affordable price.

Recognizing the potential to save communities money, upgrade their infrastructure with energy-efficient technologies, promote energy independence, and help to insulate municipal plants from electricity and gas price fluctuations, MassDEP decided that this was an area of opportunity to capture additional efficiencies and renewable power.

IMPROVING RESULTS

As of June 2010, MassDEP and its public and private partners are expanding the energy management pilot to reach all of the 370 municipal wastewater and drinking water facilities in Massachusetts.

MassDEP will continue to work in partnership with additional wastewater and drinking water utilities, EPA New England, the Executive Office of Energy and Environmental Affairs (EOEEA), the Department of Energy Resources (MA DOER), UMass / Lowell Center for Sustainability, and the major energy efficiency program providers (NGRID, NSTAR, Cape Light Compact, Western MA Electric, Unitil, Bay State Gas, Berkshire Gas, and other Municipal electric and gas utilities) to implement EPA's Energy Management Systems approach "Plan-Do-Check-Act" for wastewater and drinking water plants. Environmental Management Systems (EMS) involves a set of management processes and procedures that allow an organization to analyze and reduce the environmental impact of its activities. EPA has developed a step-by-step workbook to help utilities use an EMS approach to reduce energy use at water and wastewater facilities. This EMS approach will be used with our partners to establish a new group of "Energy Leaders."

Using a multi-year and phased approach, we will create a new Energy Leaders group for motivating, educating and assisting water treatment facilities to

1) understand their current energy use with benchmarking,
2) undertake projects to improve energy efficiency,
3) increase clean generation capacity, and
4) achieve zero net energy operational status.

This structured process will offer educational seminars, technical assistance, energy audits and renewable energy feasibility assessments, information on available funding sources and innovative financing models for the entire sector. Intensive assistance will be offered to a select group of "Energy Leaders" to focus on continuing energy improvements.

DETAILED WORK PLANS

A new inter-agency steering committee will foster the planning and implementation of this expanded statewide energy management initiative (see contact information below).

The statewide initiative 2010 – 2011 will:

1. Provide comprehensive energy assessments, including energy benchmarking for all public wastewater facilities, energy audits and renewable energy assessments at all wastewater and drinking water facilities.
2. Invite a group of facilities to join an Energy Leaders group, to become efficiency leaders and encourage other facilities to join.
3. Assist Energy Leaders in prioritizing and sequencing improvements.
4. Develop and maintain information clearinghouse on available funding and technical assistance.
5. Optimize lowest cost financing for prioritized projects.
6. Measure efficiency improvements and increased renewable energy generated.
7. Promote a systematic environmental management system styled - "Plan-Do-Check-Act" approach to continue energy improvements over time.

STEERING COMMITTEE CONTACTS

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We anticipate that 20-40 new water / wastewater facilities will participate in this second phase of this energy management initiative in 2010 - 2011. This structured "Energy Leaders" process will be continued, each year, until all 370 municipal water and wastewater facilities are reached.